

A VEGETATIVE KEY TO THE SPECIES OF *MUHLENBERGIA* OF MISSOURI

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This key serves to facilitate the identification of vegetative specimens of *Muhlenbergia* in Missouri as well as to supplement other keys that are based largely on spikelet characters. Species summaries and notes that may aid identification that do not readily fit into the key are also included.

Vegetatively, members of *Muhlenbergia* can resemble several other genera of grasses such as *Leersia*, *Panicum*, *Brachyelytrum*, *Agrostis*, and *Sporobolus*. But, in general, *Muhlenbergia* species have a gestalt all their own (see Yatskievych [1999] for a description of the genus). Perhaps the most useful character is the presence of scaly rhizomes that occur in all species except *M. cuspidata*, *M. capillaris*, and *M. schreberi*. When present, these rhizomes are easily identified as being thicker than the roots and covered with conspicuously overlapping scales. Although *Brachyelytrum* can have similar rhizomes, the septate venation pattern of the leaves quickly distinguishes it from any *Muhlenbergia*. Beyond this, the gross similarity among species can be overwhelming and requires close attention to seemingly obscure details. Among the most important details are the presence and degree of pubescence on the stem internode, the ligule length, and the general habit of the plant.

Adding to the difficulty of identification is the fact that most species of *Muhlenbergia* appear to demonstrate little affinity toward specific habitats. Several species are as likely to be found in prairies or old fields as they are in mesic bottoms or upland forests. Although *M. sobolifera*, *M. cuspidata*, and *M. capillaris* are more habitat-specific than others in the group, the remaining taxa seem to thrive in open and edge habitats where light availability, more than moisture, dictates their occurrence and persistence. As one gains familiarity with species of *Muhlenbergia* and their habitats, the distinctions between species and the character syndromes within the group become much more apparent.

The specific nature of this key requires detailed descriptions that general terminology often falls short of capturing. In order to instill

additional clarity, the following terms and concepts are defined as they fit the specifics of *Muhlenbergia* and as they are utilized in this key:

Collar:—The margins of a grass leaf where the blade and sheath meet is termed the collar. Within *Muhlenbergia* there are essentially two collar types. One type is inconspicuous and consists of a simple continuation of blade margin to a tapering base (*Setaria*-like). The other type is derived from a wider base where the blade curves abruptly to the sheath and thus creates a shelf-like collar (*Agrostis*-like). Caution must be exercised because some *Muhlenbergia* have one collar type on primary stem leaves and the other on secondary leaves.

Internode Pubescence.—The internodes of *Muhlenbergia* can be very diagnostic, especially in terms of pubescence or lack thereof. All muhly grasses found in Missouri conform to one of four internode types:

1. Glabrous (without pubescence);
2. Scaberulose (with short inconspicuous hairs) just below the node and continuing ca. 5 mm down the internode;
3. Scaberulose below the node and continuing well beyond 5 mm down the internode;
4. Retorse (downward pointing) hairs on the node and often continuing along the upper internode.

Primary stem leaf.—By mid- to late summer, most muhly grasses have produced axillary leaf fascicles from which inflorescences eventually arise. The leaves within these fascicles are smaller and often of different proportion than the main stem leaves that subtend them. Because of the ambiguous nature of these two leaf types, the leaf characters utilized in this key apply to those leaves that are found on the original stem axis prior to the expansion of the axillary fascicles. Said leaves are the primary stem leaves.

Tufted.—In terms of this key, a tufted grass is one that forms and maintains basal leaves or basally disposed leaves. Although most of the non-tufted grasses in the key may occur in colonies, their leaves cannot be interpreted as basal or basally disposed. Caution must be expressed in the

interpretation of *Muhlenbergia asperifolia*, which forms loose tufts connected by long rhizomes.

1. Plants growing in tufts* (rarely solitary) or single stemmed with basally disposed leaves; mature leaves narrow, long-linear and 30-100 times longer than wide
 2. Ligule 2 mm long or longer *M. capillaris*
 2. Ligule less than 2 mm long
 3. Plants bulbous-thickened at the base and lacking rhizomes; plants of calcareous habitats in glades, bluff escarpments, dry prairies and loess hills *M. cuspidata*
 3. Plants clearly rhizomatous and lacking bulblike roots; plants of sandy soils, railroads, lawns and waste areas, generally acidic or neutral soils *M. asperifolia*
1. Plants not growing in tufts* and when single stemmed not possessing basally disposed leaves; leaves wider, more lanceolate to linear-lanceolate and 10–40 times longer than wide
 4. Nodes and upper portions of internodes* with conspicuously retrorse hairs; sheaths often lightly hirsute; primary stem leaves* often more than 10 mm wide *M. tenuiflora*
 4. Nodes and upper portions of internodes* glabrous or with scaberulose (minute/rough) pubescence; sheaths always glabrous; primary stem leaves* less than 10 mm wide
 5. Small slender-stemmed plants, often with a sprawling habit; collar* margin with a minute ciliate pubescence (use 10× magnification); plants without scaly rhizomes *M. schreberi*
 5. Larger stout-stemmed plants with an erect habit; collar* glabrous; plants with scaly rhizomes
 6. Internodes* smooth and glabrous throughout (this requires close examination and is easy to test by rubbing a metal probe or fingernail along an internode just below the node)

* An asterisk (*) indicates a term or concept defined in the introduction.

7. Primary stem leaves* scarcely tapering at the base and with a well- differentiated collar* (*Agrostis*-like); primary leaf blades ascending to erect; lower internodes occasionally oval in cross-section; glumes greatly exceeding lemmas; mostly absent from Ozarks and Bootheel region of Missouri *M. racemosa*
7. Primary stem leaves* noticeably widest toward the middle, tapering to the base and lacking a well-differentiated collar* (*Setaria*-like); primary leaf blades spreading; glumes slightly longer than, equal to, or shorter than lemmas; occurring within but not limited to Ozarks and Bootheel of Missouri
8. Ligule conspicuous, 0.8 to 1.5mm long
 *M. frondosa*
8. Ligule nearly absent and difficult to detect, less than 0.8mm long
9. Plants unbranched to relatively few-branched (when present, branches erect and appressed to stem); most stem leaves large, well spaced and rarely overlapping in dense fascicles as the growing season progresses; stem leaves perpendicular to the stem or slightly ascending; plants of dry and/or rocky woodlands *M. sobolifera*
9. Plants often profusely branched (branches typically not appressed to stem); stem leaves of various sizes but with many smaller leaves overlapping in fascicles at the ends of the branches and/or at nodes as the season progresses; stem leaves ascending or nearly appressed to the stem; plants usually of low moist slopes along streams, river banks, bases of bluffs, and other mesic to wet habitats *M. bushii*

6. Internodes* with a short scaberulose (minute/rough) pubescence just below the nodes (this requires close examination and is easy to test by rubbing a metal probe or fingernail along an internode just below the node)
10. Primary stem leaves* 3–5(–8) cm long and 1.5–4.0 mm wide; no tuft of hairs at the base of the lemmas *M. glabrifloris*
10. Primary stem leaves* 5–20 cm long and 3–8 mm wide; lemmas with a small tuft of hairs at the base
11. Scaberulose pubescence limited to the uppermost 3–4 mm of the internode* (do not mistake the waxy dull cuticle of the upper internode for pubescence)
12. Ligule inconspicuous, 0.3–0.8 mm long; plants with relatively little branching from nodes (branches, when present, appressed to the stem); plants of dry and/or rocky woodlands *M. sobolifera*
12. Ligule quite conspicuous (0.8–1.5mm long); plants often profusely branching from the nodes (branches, when present, typically not appressed to the stem); plants typically of moister sites but some habitat overlap exists with *M. sobolifera* *M. frondosa*
11. Scaberulose pubescence present well beyond the uppermost 3–4 mm of the internode*
13. Ligule 1.0-2.5 mm long *M. sylvatica*
13. Ligule 0.4-1.0 mm long *M. mexicana*

Muhlenbergia asperfolia (Nees & Meyen) Parodi.—This is a very uncommon grass that grows in well-spaced tufts connected by long rhizomes and has leaves 3–7cm long and 1.0–2.5 mm wide. Steyermark (1963) reported *M. asperfolia* from three counties (St. Louis, Holt, and Jackson) where it inhabits railroad yards and open sandy places.

Since then it has been documented from three additional counties (Atchison, Hickory, and Ripley) adding lawns, roadsides, loess hill prairies, lake margins, and disturbed areas to its list of habitats (Yatskievych 1999). Although probably native in the loess hill prairies of northwestern Missouri, other populations in the state probably represent introductions.

Muhlenbergia bushii R.W. Pohl.—The combination of smooth, shiny internodes, relatively small ligules, and a diffusely branched habit (late season) readily distinguishes *M. bushii* from similar species. Although it is most common along stream banks and bottoms, *M. bushii* has been noted from a wide variety of habitats, usually in shaded, somewhat moist sites.

Muhlenbergia capillaris (Lam.) Trin.—This species is a widely distributed but often overlooked grass of glades and dry open woods, where it prefers acidic soils. This is the largest of the three tufted *Muhlenbergia* in Missouri and one of three that lacks scaly rhizomes. Like the other tufted species, the leaves of *M. capillaris* are long-tapering and held close to the culm. Additionally, the large round-tipped ligule of this attractive grass can be 7 mm or more long, making it unique from any grass with which it might be confused. *Muhlenbergia capillaris* blooms in the fall with large wispy purplish-pink inflorescences that can be seen from quite some distance. The spikelets are typically awned with flexuose hair-like projections.

Muhlenbergia cuspidata (Torr.) Rydb.—An infrequent grass of scattered distribution found mostly on or near the edges of exposed limestone bluffs as well as in dry calcareous prairies, limestone glades, and loess hill prairies. This grass characteristically forms erect tufts with twisted wiry leaves that do not exceed 3 mm in width. The plants are also bulbous-thickened at the base. The inflorescence is a small spike-like panicle and the spikelets are awnless.

Muhlenbergia frondosa (Poir.) Fernald.—The combination of glabrous internodes and a long ligule easily distinguish this *Muhlenbergia* from the other large non-tufted species. *Muhlenbergia frondosa* occurs twice in the key because rarely a light pubescence may be detected on the upper 3–4 mm of the internodes. However, the vast majority of specimens have completely smooth internodes and will readily key out

in couplet 8. *Muhlenbergia frondosa* is common in a wide variety of habitats. It becomes highly branched and often sprawls late in the season.

Muhlenbergia glabrifloris Scribn.—This grass is uncommon and scattered throughout the state. In terms of habit, it resembles *M. racemosa*, but is considerably smaller, and tends to occur more consistently in moist clayey sites. Fertile specimens are readily discerned from all other *Muhlenbergia* in the state by the absence of hairs at the base of the lemmas.

Muhlenbergia mexicana (L.) Trin.—This species is readily recognizable by the rough internodes and the relatively small ligule. It is found in a variety of habitats throughout the state but is generally uncommon.

Muhlenbergia racemosa (Michx.) Britton, Sterns & Poggenb.—Although this is one of the most vegetatively distinct *Muhlenbergia* species in our range, it is also the most difficult to discriminate in a key. This fact may cause some confusion in couplet 7. Users must evaluate the overall shape and orientation of the primary stem leaves. Those of *M. racemosa* have a tendency to overlap more than most other species. The lower internodes of *M. racemosa* are occasionally oval in cross-section. The species typically grows in moist open habitats and is mostly absent from the Ozarks and Bootheel regions of the state.

Muhlenbergia schreberi J.F. Gmel.—This species has short shiny thin stems and is the smallest of the non-tufted *Muhlenbergia* in Missouri. As autumn approaches, the stems of *M. schreberi* become diffusely branched, giving the plant a sprawling habit. The primary stem leaves do not exceed 4 mm wide and have ciliate margins along the collar region. Observation of the pubescence usually requires magnification. *Muhlenbergia schreberi* is the weediest and most commonly encountered *Muhlenbergia* in the state and is found in a variety of habitats, but seems to prefer trailsides, pastures, waste ground, and lawns. This species is almost never found in high quality native plant communities.

Muhlenbergia sobolifera (Muhl.) Trin.—This is a common element of dry woodland slope communities where it grows in rather small,

open colonies. The internodes of *M. sobolifera* are almost always lightly pubescent on the upper 3–4 mm, but also can be completely glabrous. Users should be wary of any specimen that has completely smooth internodes and keys to *M. sobolifera*. Such a condition is rare for *M. sobolifera* and could be a misinterpreted *M. bushii* or *M. frondosa* instead. However, the “flagging” habit of the leaves on a perpendicular stem and the lack of autumnal branching make this an easily recognized grass. Although characteristically found in drier sites than other *Muhlenbergia*, *M. sobolifera* is also known to inhabit more mesic communities, but it never grows in completely open habitats.

Muhlenbergia sylvatica (Torr.) Torr.—The combined characters of roughly pubescent internodes and a relatively large ligule make this one of the easiest species of *Muhlenbergia* to identify. *Muhlenbergia sylvatica* is quite common throughout the state and occurs in a wide variety of habitats.

Muhlenbergia tenuiflora (Willd.) Britton, Sterns & Poggenb.—This grass is easily identified by the presence of hirsute pubescence along the sheaths and retrorse pubescence on the nodes. With leaves often becoming 10–15 mm wide, *M. tenuiflora* has the widest leaves of all muhly species in Missouri. Due to the width of its leaves and degree of pubescence, *M. tenuiflora* can be confused with *Brachyletrum erectum*. However, the two are readily distinguished by the “shattered” (septate) venation pattern found in *Brachyletrum*. Like *M. sobolifera*, *M. tenuiflora* is usually unbranched and grows in sparse colonies. This handsome grass is found scattered throughout the state in relatively moist habitats such as bottomland forests, creek banks, mesic woodlands and shaded bluffs.

LITERATURE CITED

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